UNIVERSITÀ DEGLI STUDI DI PALERMO

DIPARTIMENTO DI SCIENZE E TECNOLOGIE BIOLOGICHE CHIMICHE E FARMACEUTICHE (STEBICEF)

CdLM BIB and BCM *Seminars*
Scientist around the World

giovedì 8 gennaio, ore 12:00

presso l'aula Randazzo (aula 2) del Dip. STEBICEF
Viale delle Scienze, edificio 16

il Prof. Gioele La Manno

Brain Development and Biological Data Science lab
Swiss Federal Institute of Technology Lausanne (EPFL)

terrà un seminario dal titolo:

Spatiotemporal approaches to dissecting brain cell state emergence, dynamics, and modulation

Abstract: Brain development involves complex cellular heterogeneity, with states that change across time and space. Understanding these processes requires approaches that can capture how cellular states transition, organize spatially, and respond to signals. Such approaches are the more useful the more they are able dissect such a complex machinery and the more they offer opportunities to reveal how disruptions contribute to disease. I will present three research lines that are motivated by this need to advance our fine understanding of brain developmental processes.

First, focusing on dynamics, I will describe how we elevated RNA velocity estimation into a statistical inferential framework for answering well-posed biological questions. I will introduce VeloCycle, a heuristics-free Bayesian method that exploits the consistency between vector fields and manifold geometry while correctly quantifying uncertainty. We validate that VeloCycle detects quantitative differences and captures speed variations between prosomers and in Perturb-seq screens.

Second, I will present our systematic mapping of neural progenitor organization in the embryo using large-scale HybISS, enhanced by two deep learning tools: Spotiflow and PointillHist. This work charted hundreds of distinct cell states, with PointillHist learning histological patterns to build a comprehensive atlas of embryonic brain organization. This atlas provides a reference framework for interpreting perturbation outcomes, ranging from subtle adaptations to catastrophic malformations.

Specifically, I will show that Shh organizer ablation triggers region-specific cellular responses, while folate deficiency exposes unexpected vulnerabilities in high Folr1-expressing radial glia of cortical hem organizers.

Finally, moving beyond transcriptomics, I will focus on key cellular components that modulate how cells respond to signals: membrane lipids. I will present uMAIA, a platform enabling large-scale lipidomic profiling and construction of the first comprehensive Lipid Brain Atlas. This resource reveals "lipizones"—spatially organized metabolic territories that define functional anatomy beyond cellular composition. Lipizones capture connectivity patterns, uncover oligodendrocyte heterogeneity axes in white matter, and reveal biochemical zonation in the choroid plexus and ventricular walls. We further show that this lipidomic architecture adapts dynamically to physiological demands during pregnancy, opening a new axis for exploring singaling odulation in brain development.

L'invito è aperto a tutti i dottoranti e docenti dei dottorati in:
SCIENZE MOLECOLARI E BIOMOLECOLARI
TECNOLOGIE E SCIENZE PER LA SALUTE DELL'UOMO